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of the trench, which also has a material effect on costs. There are other records which ought to be kept in order to enable the superintendent to check up the performance of a gang today with what a similar gang did in previous years.

The men in charge of construction work are facing the fact that not only are their records of costs in the past likely to be greatly exceeded by the cost of work done hereafter, but those records are in too many cases so incomplete that it is not possible to tell from them whether a good showing on a particular job was due to a good foreman, or to energetic experienced men in the gang, or to any other cause. The superintendent knows that he cannot get so much work from labor as he formerly did, dollar for dollar, and he is consequently giving more attention to labor-saving equipment. Such equipment will undoubtedly be useful in many cases, but one of the most useful things in the successful prosecution of construction work will be a cost keeping system which will show what different parts of the work are costing in such a clear and accurate way that possibilities of making savings can be studied without resorting to guess work. We are all facing the same problem, how to accomplish the best that is in us and how to help those working with us to accomplish the best of which they are capable, that the period of national readjustment may be as brief as possible. We cannot tell that we are living up to this aim without a system of records which will enable us to see what is really going on. The average man can learn what such records are worth by keeping account for a few days of what he does with his time. It is not difficult but the result, when examined some quiet evening, is likely to be a shock and a spur to better performance.

W. W. BRUSH.

ENGINEERS IN BUSINESS

At the present time the compensation received by civil engineers is so small, owing to the reduced purchasing power of the dollar, that the modest salaries formerly paid to them are wholly inadequate for the standard of living to which they are entitled as a result of the expensive education and long training needed to fit them for places of responsibility. As a result there is a general tendency for engineers to turn their attention to commercial and administrative pursuits. There is a considerable demand for engineers at the old rates

of compensation and for skilled draftsmen and designers. Such work is still attractive to those who like engineering, but the compensation for it is not considered adequate and accordingly the alleged greater opportunities in business pursuits are being investigated. As a necessary consequence of this, the technical schools, which see the handwriting on the walls, are abandoning their former claim that a course in engineering fits a man for about anything except the law, medicine and the pulpit, and are seriously contemplating developing courses in business engineering, engineering business, or any other name that can be thought of which sounds attractive.

A very large part of the engineers who graduate from a technical school and achieve success never have occasion to use more than a small part of the subjects they were taught to consider absolutely necessary for any engineer to master. They generally spent four years in a high school or academy and then four years in a technical school in order to fit themselves for their engineering career. They were told that they could not be fitted in less time. They compare their experience with that of their boyhood friends of equal ability who went part way, or all the way, through high school and then entered business, and find that most of these business men are earning more money than they are. They feel that this is wrong, that their expensive education and great responsibilities merit at least equal compensation, but they forget two things, first, that the information they are really using could have been acquired in less than eight years and, second, that there is no difficulty in filling their places when they resign, without any increase in compensation. They also overlook the fact that there is a plain indication of the value of the ordinary business man, namely, the profits which he can show he has made for his employer, whereas up to date there is no indication of the profits which a competent engineer can show because his work is that of a spender in most cases.

There was a conference in Washington in June at which a large number of educators of engineers discussed the means of supplying the demand for men of engineering knowledge and business training. There is no greater demand for such men now than there was during a period of several years before the United States entered the war. More engineers are looking for such places, however, and they are talking so much about it that there is a misconception of the real situation. Employers of salesmen for whom engineering knowledge is useful are not looking, as a rule, for men whose engineering knowl-

edge has been acquired solely in schools; they desire men who have had field experience and who are salesmen by temperament. Now the qualifications for successful salesmanship and successful business administration are not the same as those for successful engineering practice, unless the last term is stretched to include the administrative responsibilities which the engineering heads of some organizations must possess in order to discharge their duties successfully. Consequently the attempt to graft on to a course in engineering a course in economics and one in salesmanship is an educational problem of the highest complexity, unless it is assumed that the student has the time and money to spend more than four years at his special studies.

As a matter of fact, there are many excellent opportunities for engineers in business, but rarely as engineers and this fact they should not forget. One of the leading authorities on a special branch of mechanical engineering never speaks of himself as an engineer, although every week his engineering advice is sought and followed by eminent engineers, but invariably designates himself as a salesman. Every assistant he has is not only a technical graduate but also an engineer of some practical experience, yet every one of them is definitely instructed not to claim to be an engineer but to call himself a salesman. A similar policy is followed by some of the largest manufacturers of electrical equipment, which maintain engineering organizations to give technical advice to customers but forbid these men to discuss sales, which are handled exclusively by other men of engineering experience and generally of technical education but known as sales representatives solely. In short, if an engineer goes into business or into administrative work he must step out of his position of engineering authority, and the trouble with engineers in such places has been that they endeavor to control the details of engineering matters under them and neglect the business and administrative problems which are their special province.

There is no administrative field in which engineering knowledge is of more value than in the management of public utilities. Many of the best known managers today have been drawn from engineering circles. That is, perhaps, not the best method of stating the facts; these men have usually asked to be transferred from the engineering to the administrative departments. They were able to show that they had qualifications which warranted giving them a trial and they made good. Engineering knowledge in itself is not a qualification

for administrative positions; it is merely a useful accomplishment, so to speak. So in all these discussions of engineering salesmen and engineering administrators and methods of turning them out of technical schools by changing a few of the subjects taught, the fact is not recognized that a salesman or an executive deals with men and not with the direction of the forces of nature to the good of mankind, and, up to date, there is not a single subject in engineering courses which throws light on why one man has influence and another has none. Both salesmanship and administrative work call for forceful personality, and an engineer who has it and is dissatisfied with his engineering position can look about for change of pursuits with some hope of winning success. But the engineer who does not have a forceful personality but is a good engineer, will do better to stay in engineering.

JOHN M. GOODELL.